AMHERST COLLEGE.

AN

Anthropometric Manual

GIVING

PHYSICAL MEASUREMENTS AND TESTS

—OF—

MALE COLLEGE STUDENTS,

AND THE

METHOD OF SECURING THEM.

Prepared from the Records of the Department of Hygiene and Physical Education in Amherst College, during the years 1861–2 and 1892–3 inclusive.

THIRD EDITION.

BY DR. E. HITCHCOCK AND DR. H. H. SEELYE.

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THE MANUAL.

When the Department of Hygiene and Physical Education was established in Amherst College, one of the first matters attended to was the Physical measurement and tests of the students. The methods were crude and simple in 1861 and 1862, for the word Anthropometry had hardly found its way into an American Dictionary at that time.

A few simple tests and examinations were made then of every student in the College, and now, with enlargements and improvements made ever since, the last student on the books is number 2647, and the records are all preserved.

A prominent thought in securing these measurements was to take them at least once each year, and thus enable the student to see his own growth. It was also hoped it would show the effect of the new system of Physical Culture upon the College. Besides there was to be presumed a generous rivalry between individuals and the different classes, to determine excellence and superiority. And in the mind of President Stearns—the father of the Department—there was a need to attend to the physical as well as to the intellectual and moral growth of the young men. And closely akin to this was the belief that with a more thorough attention to the physical man the many who were defective, and unable to do their best head work might be improved and made more efficient men now and hereafter. So that if the young man were weak from heredity or poor development, there should attention be given to find out where this weakness was, and ways might be devised to correct and eradicate the non-developement.

All this meant the study of the student; what his present condition might be; what he brought with him from father and mother; and what the average young man ought to be as he goes through college.

To learn what is the condition of our young men as they come to us, and how, and in what way can we help them to grow while connected with us, is the ultimate aim of the Anthropometric work of

Amherst College. And the carrying out of this object involves the accurate observation of the physical characteristics of the students, and by a patient and long time process of comparing data, finally enables the Department to declare to them a standard by which they may be judged. And the main results of all this work has been the gathering of thousands of individual numerical records, and many aggregations, compilations, and reductions of these in more or less perfect tables which have been brought to the public from time to time, and are now in constant use.

Every student very naturally enquires, how much should I measure, what is the lung capacity I ought to have, what are the powers of muscle which I ought to possess to be a man of promise now, and of vigor bye and bye.

To answer these questions he must be referred to some ideal standard, or at least to some recognized method of comparison.

The results of this work at Amherst have been put together in different ways; that of the Average College Student, the Class study, the arrangement by the Age of the individuals, the doctrine of Means, of Percentages, the student 21 years old, and the *Stature or Height of the individual.* And as in most of these tables more than a thousand different individuals are compared it does seem possible to give some statements and principles to the class of young men with which they have to do that may be relied upon and worked with.

At Amherst College we have come to the conclusion that Stature or Bodily Height is the *criterion* by which we may judge of the normal conditions of bodily measurements, or, *the unit of comparison for the bodily outlines, capacities, and powers, is the distance from the top of the head to the sole of the foot.*

With this idea in mind every young man who comes to Amherst College is most carefully and minutely examined in his essential bodily parts and powers by an Educated Physician and his exact record made out and furnished to him by the side of the average measures of 1322 students between 17 and 26 years of age with which they may be compared at a glance. The student may not only thus see his own resemblance to or deviation from the men of his own height, but in the manual he will find the directions given him by the examining physician how to correct imperfect or abnormal deviations from the standard. And not only will he of himself and by himself be thus guided, but he may also have the constant oversight and watch of a Physician and a trained and experienced athlete on the Gymnasium floor and in the Athletic Field.

The first beginnings of this scheme were the eight items of age, weight, height, chest girth, arm girth, forearm girth, lung capacity and pull up, which though somewhat enlarged in number were taken from every student from 1861 to about 1880, when more elaborate and multiplied items were suggested by W. T. Brigham of Boston which were methodized and arranged by Dr. D. A. Sargent of Harvard College and so first used here in 1882.

In 1885 the American Association for the Advancement of Physical Education at a meeting in Brooklyn appointed an Anthropometric Committee consisting of Dr. D. A. Sargent of Cambridge, Dr. E. Hitchcock of Amherst, and Dr. W. G. Anderson of Brooklyn to propose a uniform method of taking and securing these statistics. At the meeting of the Association in 1886 this report was made, accepted and adopted by the Association, a copy of which is here inserted. And it is this method which is practically used at Amherst to-day, as the fundamental parts of it have been used for the past 31 years.

DIRECTIONS FOR SECURING ANTHROPOMETRIC MEASUREMENTS OF THE HUMAN BODY AS ADOPTED BY THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF PHYSICAL EDUCATION.

NUMBER.—In order to secure privacy the individual should be entered in the record book by number. As a means of identification the number can be entered in an alphabetical index book opposite the corresponding name, as:

Smith, John H., 526.

For further convenience it is advisable to enter the name in a numerical index book opposite the corresponding number, as:

526, John H. Smith.

DATE.—Record the year, month, day and hour, as: Jan., '86, 12, 9 A. M. Where perfect accuracy is desired, note should be made of the time that has elapsed since eating, the occupation of previous hours, and of the temperature of the room.

AGE.—Record years and months, as: 21, 9, *i. e.* twenty-one years and nine months.

WEIGHT.—The weight of the body should be taken without clothes. Where this is impracticable the weight of the clothes should be deducted.

HEIGHT.—The height should be taken without shoes and with the head uncovered. The head and figure should be held easily erect, and the heels together. This position is best secured by bringing

the heels, buttocks, the spine between the shoulders and the back of the head in contact with the measuring rod.

Height of Knee.—The subject should place one foot on a box or chair of such a height that the knee is bent at a right angle. A box about 12 inches high is suitable for adults. Press a ruler upwards with a force of about one pound against the ham string tendons close to the calf of the leg. See that the ruler is held in a position at right angles to the vertical rod, and measure the height of the top of the ruler from the box.

Height Sitting.—Let the subject sit on a hard, flat surface about 12 inches high, such as afforded by a box or chair, with the head and figure easily erect so that the measuring rod will touch the body at the buttocks, between the shoulders, and at the back of the head. Measure the distance from the box to the vertex.

Height of Pubes.—With the subject standing easily erect on the box or floor, measure up to the upper edge of the pubic bone.

Height of Crotch.—With the subject standing easily erect on the box or floor facing the vertical rod, press a ruler firmly against the perineum (crotch) and measure the height of the top of the ruler.

Height of Navel.—With the figure and head of the subject erect, measure the height of the centre of the cicatrix.

Height of Sternum.—With the figure and head of the subject erect, measure the height of the interclavicular notch.

Girth of Head.—This measurement should be taken around the head with the tape at the upper edge of the eye brows, over the supra orbital and occipital prominences. All girths should be made on the skin itself and at right angles to the axis of the body or limbs at the point of measurement. No oblique measurements are taken.

Girth of Neck.—With the head of the subject erect, pass the tape around the neck half way between the head and body, or just below the "Adam's apple."

Girth of Chest.—Pass the tape around the chest so that it shall embrace the scapulae and cover the nipple. The arms of the subject should be held in a horizontal position while the tape is being adjusted and then allowed to hang naturally at the sides. Take the girth here before and after inflation.

Where it is desirable to test the elasticity or extreme mobility of the walls of the chest, a third measurement may be taken after the air has been forced out and the chest contracted to its greatest extent. To test the respiratory power, independent of muscular development,

The Anthropometric Card of Amherst College.

The study of the physical condition of the students of Amherst College by means of the measurement of their bodies is carried on as a part of the work of the Department of Physical Education and Hygiene. Every man, save an occasionally imperfect one, is carefully examined and his record preserved in the books of the Anthropometric Laboratory, until reliable results can be now secured from the large number of physical data at hand.

The main result sought for in this study, is to learn what is the physical form, size and strength which each young man may expect to have, and how these conditions may be adjusted or perfected, so as to give him the greatest efficiency in life, now, and farther on. In the absence of a record of the physical perfection of Adam or Eve, there seems to be no other way to obtain our pattern, model or standard, than to examine and compare accurately and minutely a sufficiently large number of living men, so as to form an idea of what are the present conditions of them, and then study how to make

This method of measurement record is the one made use of in the Anthropometric Laboratory

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In all our sociological, mercantile and intellectual lines of labor in the world we expect, and do find an average, or mean, which helps us to draw our conclusions. We expect certain attainments, whatever their nature, of the average man or woman, and when these are not about what we look for, we mark the individual as below par; but when we find more than the ordinary expectation we rejoice that we have got something better than usual. This average or mean in the man or woman seems to be the point which we must start from, not as a standard to be reached and satisfied with, but as the base line from which we must begin to work.

In the accompanying table are presented the results of the measurements of 1322 students of Amherst College secured within the past nine years. They are grouped and arranged according to the Height or Bodily Stature of the individual as the starting point. Thus, at the extreme upper left of the table are to be found "1600 m.m." and "63.0 inches." This means that the men who were from 1600 m.m. to 1609 m.m. in their stature gave an average of all the other 53 items as designated at the top of the page on the same line with 1600 m.m. Also the other headings, 1610, 1620 and so on down the column are to be understood in the same way. So that when the man knows his height, he can readily find what should be the measure and tests of the various parts and powers of his body, as compared with all these student measures as tabulated here.

The average height of all the students of Amherst College for the past 30 years is 1725 m.m., or 67.9 inches. And the average measures of all the physical data are these enclosed by the heavy black lines running across the table against "1720 m. m."

In using this table and its blank for an individual examination, as the measures are taken they are recorded in pen and ink in the blank spaces at the bottom of the page. Then to find out his relations to either the average student, or to those of his own height, with pencil or pen, he would make a mark from the left corner of the space of his "Stature" measurement to the corresponding space of his "Weight," then to "Sternum"; and so on through the whole series of the table. Thus when completed he would find a more or less zig zag line across the page according as he deviated from the average of his own height, showing him by the curves whether he was above or below his average.

This method of measurement record is the one made use of in the Anthropometric Laboratory of Amherst College for the physical examination of its students. This examination is called for three times during the four years' course, and the record kept in the fire proof safes of the Department to which the individual examined may have reasonable access so far as his own record is concerned. And should he desire a more frequent examination the Department will readily grant it to him.

This table and method however do not offer to the young man an ideal or typical standard which he may try to reach as if he were passing a competitive examination. It often shows him that he probably has not the powers and endowments which it is possible for him to have. He can see the condition of his fellows and with proper, well trained, and well directed cultivation of his capacities, may rise to higher attainments and possibilities of achievements in his physical, mental and spiritual life and yet not with the zeal and furor, and possible dangers of a contest, or a prize stimulus. He may neither neglect one part of it, nor give undue attention to either of the other parts of his nature without endangering the whole. While he is not a machine yet he is an organic unity which is not directed by physical force but by a soul which has all power over both mind and matter. And the Theory and Practice of Anthropometry gives to the spiritual element of the individual a greater insight into the possibilities of the man, and helps him to make much more of his individual, immortal, manhood.

An Anthropometric Study of the Students of Amherst College.

Constructed upon Bodily Stature as the Basis of comparison, from measurements of 1322 students between 17 and 26 years of age. The black figures represent millimeters, kilograms and liters; the red, inches, pounds and cubic inches.

First Edition, March, 1892; Second Edition, May, 1893.

STATURE.	WEIGHTS.	HEIGHTS. Sternum.	Navel.	Pubes.	Knee.	Sitting.
1600 mm.	53.9	1290	947	797	425	851
1610 mm.	54.0	1300	958	800	430	856
1620 mm.	54.1	1300	962	810	439	869
1630 mm.	54.5	1320	966	812	442	870
1640 mm.	54.7	1330	974	814	448	879
1650 mm.	55.5	1340	979	820	448	880
1660 mm.	57.3	1350	983	835	450	883
1670 mm.	57.9	1350	986	839	454	884
1680 mm.	60.1	1360	991	853	460	891
1690 mm.	60.2	1400	1020	862	473	905
1700 mm.	61.3	1400	1020	863	474	908
1710 mm.	61.3	1400	1020	863	474	908
1720 mm.	61.7	1410	1020	867	478	910
1730 mm.	62.1	1410	1040	870	484	918
1740 mm.	62.5	1420	1050	874	486	918
1750 mm.	63.9	1430	1050	880	486	918
1760 mm.	65.1	1440	1060	886	489	924
1770 mm.	67.8	1450	1060	895	494	925
1780 mm.	67.8	1450	1070	896	499	925
1790 mm.	68.0	1460	1080	899	500	933
1800 mm.	68.2	1470	1090	907	504	934
1810 mm.	68.2	1480	1090	918	517	937
1820 mm.	68.3	1480	1090	919	519	939
1830 mm.	68.3	1500	1107	921	525	939

STATURE.	GIRTHS. Head.	Neck.	Chest Repose.	Chest Full.	Belly.	Hips.	Right Thigh.	Left Thigh.	Right Knee.	Left Knee.	Right Calf.	Left Calf.	Right Instep.	Left Instep.	Upper Right Arm Contra'td	Upper Right Arm.	Upper Left Arm.	Right Elbow.	Left Elbow.	Right Forearm.	Left Forearm.	Right Wrist.	Left Wrist.
1600 mm.	559	335	851	881	702	860	500	497	341	339	325	323	231	229	275	248	244	241	237	253	248	161	159
1610 mm.	561	338	852	882	703	860	501	498	341	339	326	324	231	229	277	248	244	241	237	253	248	161	159
1620 mm.	562	340	854	888	703	864	501	498	342	340	333	331	232	230	280	248	244	242	238	253	248	162	160
1630 mm.	562	345	857	900	703	864	501	498	343	341	335	333	233	231	280	252	248	242	238	254	249	162	160
1640 mm.	563	345	857	900	708	873	503	498	344	342	336	334	234	232	282	253	249	242	238	254	249	162	160
1650 mm.	563	346	864	901	709	879	504	500	346	344	337	335	236	233	283	254	250	242	238	255	250	162	160
1660 mm.	565	347	865	903	710	881	506	503	347	345	340	338	236	233	285	254	250	245	241	256	251	162	160
1670 mm.	565	348	868	904	710	882	509	506	348	346	342	340	237	235	285	254	250	245	241	257	252	163	161
1680 mm.	565	348	872	905	714	882	517	514	351	349	345	343	237	235	287	254	250	247	243	258	254	163	161
1690 mm.	566	350	872	909	722	884	517	514	352	350	345	343	237	235	287	257	253	249	245	261	256	164	162
1700 mm.	571	350	876	913	722	886	518	515	354	352	346	344	237	235	290	257	253	249	245	261	256	166	164
1710 mm.	571	352	880	916	723	886	519	516	355	354	347	345	239	237	292	257	253	249	245	262	257	166	164
1720 mm.	572	353	887	926	723	888	520	517	357	355	347	345	241	239	293	260	258	252	248	263	258	166	164
1730 mm.	572	354	887	930	726	895	521	518	360	358	351	349	242	240	295	260	258	252	248	263	258	167	165
1740 mm.	572	354	889	931	729	896	522	519	361	359	351	349	244	241	296	261	257	254	250	263	258	167	165
1750 mm.	572	355	889	931	731	908	522	519	364	361	351	349	244	241	296	261	257	254	250	263	258	167	165
1760 mm.	573	355	890	931	733	912	522	519	365	363	353	351	245	243	296	260	258	254	250	264	259	168	166
1770 mm.	574	355	890	934	738	912	523	519	366	364	353	351	245	243	296	260	258	255	251	265	261	168	166
1780 mm.	575	356	891	936	741	912	523	519	366	64	358	351	246	244	297	261	259	255	251	266	261	168	168
1790 mm.	576	356	893	936	745	916	523	519	367	365	354	352	247	245	300	261	259	256	252	267	262	169	167
1800 mm.	582	356	894	938	743	921	524	522	369	67	354	352	247	245	300	261	259	256	252	268	263	170	168
1810 mm.	582	356	898	939	748	921	524	522	369	67	356	354	247	245	300	262	260	256	252	268	263	171	169
1820 mm.	583	356	898	953	748	922	526	523	369	67	356	354	247	245	300	262	260	256	252	269	264	171	169
1830 mm.	583	356	899	956	749	923	529	527	369	37	356	354	247	245	300	264	262	257	253	269	264	172	170

STATURE.	BREADTHS. Head.	Neck.	Shoulders.	Nipples.	Waist.	Hips.	LENGTHS. Right Shoulder Elbow.	Left Shoulder Elbow.	Right Elbow Tip.	Left Elbow Tip.	Right Foot.	Left Foot.	Stretch of Arms.	Horizontal Length.
1600 mm.	151	104	413	191	245	313	349	346	430	429	242	241	1660	1610
1610 mm.	151	104	416	192	245	313	351	349	434	433	244	243	1600	1620
1620 mm.	151	106	418	192	245	315	353	350	436	435	244	243	1690	1640
1630 mm.	152	106	419	193	245	316	354	351	438	437	244	243	1690	1650
1640 mm.	152	106	423	193	247	316	357	354	442	441	247	246	1700	1650
1650 mm.	152	107	424	194	248	316	358	355	443	442	249	248	1700	1660
1660 mm.	153	107	429	195	248	316	361	356	445	444	252	251	1700	1680
1670 mm.	153	107	431	196	250	318	362	359	445	444	252	251	1720	1680
1680 mm.	153	108	431	196	252	320	368	363	446	445	252	251	1730	1690
1690 mm.	153	108	431	196	252	324	366	363	450	449	253	252	1740	1700
1700 mm.	153	108	431	196	253	330	367	364	455	454	256	255	1770	1750
1710 mm.	153	108	431	196	253	332	368	365	457	456	259	258	1770	1760
1720 mm.	153	108	432	197	254	232	369	366	460	459	260	259	1780	1760
1730 mm.	153	109	432	198	254	232	369	366	465	464	264	263	1810	1770
1740 mm.	154	109	432	198	254	335	371	369	468	467	264	263	1810	1770
1750 mm.	154	109	433	199	254	335	376	378	468	467	265	264	1810	1770
1760 mm.	154	109	438	199	254	335	381	379	468	467	265	264	1810	1770
1770 mm.	154	109	438	200	256	335	382	379	470	469	266	265	1810	1780
1780 mm.	154	109	438	200	258	336	384	381	475	474	267	266	1820	1780
1790 mm.	155	109	433	201	256	337	395	392	480	479	270	269	1850	1790
1800 mm.	155	109	439	201	256	340	399	393	484	483	273	272	1870	1790
1810 mm.	156	109	439	205	260	341	395	393	485	484	274	273	1880	1790
1820 mm.	156	109	440	206	263	341	397	394	486	485	274	273	1890	1820
1830 mm.	156	109	445	206	263	341	398	395	488	487	276	275	1890	1840

STATURE.	STRENGTHS. Lungs.	Back.	Dip.	Pull.	Legs.	Right Forearm.	Left Forearm.	Total.	CAPACITY OF LUNGS.	PILOSITY.
1600 mm.	1.3	126	8.0	10.0	130	34	31	428	3.10	2.2
1610 mm.	1.3	126	7.3	10.8	143	34	31	430	3.21	2.4
1620 mm.	1.3	126	8.8	10.6	147	34	31	447	3.25	2.4
1630 mm.	1.2	126	8.1	11.9	148	36	33	459	3.27	2.5
1640 mm.	1.2	126	7.4	10.5	149	36	33	430	3.33	2.4
1650 mm.	1.3	127	5.8	9.2	150	37	34	424	3.41	2.4
1660 mm.	1.2	128	7.3	10.8	151	37	34	423	3.50	2.3
1670 mm.	1.2	129	7.0	10.4	154	37	34	460	3.52	2.2
1680 mm.	1.2	130	8.0	10.8	159	39	36	464	3.54	2.3
1690 mm.	1.1	135	6.7	9.2	160	39	36	436	3.60	2.4
1700 mm.	1.3	136	6.9	9.3	163	40	37	441	3.63	2.2
1710 mm.	1.1	137	6.1	9.8	164	40	37	470	3.66	2.4
1720 mm.	1.1	138	6.8	9.5	164	40	37	482	3.78	2.7
1730 mm.	1.3	140	8.6	10.3	164	40	37	458	3.90	2.5
1740 mm.	1.2	140	6.0	9.1	165	41	38	449	3.91	2.3
1750 mm.	1.2	140	6.0	9.3	167	41	38	476	3.91	2.8
1760 mm.	1.2	141	5.8	8.4	168	41	38	469	4.02	2.6
1770 mm.	1.3	141	6.2	8.7	168	41	38	450	4.03	2.5
1780 mm.	1.2	141	5.6	8.9	169	41	39	499	4.05	2.2
1790 mm.	1.2	142	5.7	8.3	171	42	40	456	4.18	2.3
1800 mm.	1.1	145	4.8	8.1	172	43	40	456	4.42	2.2
1810 mm.	1.2	147	4.2	7.5	173	43	40	485	4.43	2.4
1820 mm.	1.1	147	5.6	8.1	174	43	40	467	4.43	2.6
1830 mm.	1.2	148	6.5	8.8	174	44	41	485	4.48	2.5

times during the four years' course, and the record kept in the fire proof safes of the Department to which the individual examined may have reasonable access so far as his own record is concerned. And should he desire a more frequent examination the Department will readily grant it to him.

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pass the tape around the body below the pectoral line and the inferior angles of the scapulae, so that the upper edge shall be two inches below the nipples. Take the girth here before and after inflation.

Girth of Waist.—The waist should be measured at the smallest part after a natural expiration.

Girth of Hips.—The subject should stand erect with feet together. Pass the tape around the hips above the pubes over the trochanters and the glutei muscles.

Girth of Thighs.—With the feet of the subject about six inches apart, the muscles set just enough to sustain the equilibrium of the body and the weight distributed equally to each leg in gluteal fold, measure around the thigh just below the nates.

Girth of Knee.—With the knee of the subject straight and the weight of the body equally supported on both legs, measure over the centre of the patella.

Girth of Calf.—With the heels down and the weight of the body supported equally on both feet, the tape should be placed around the largest part of the calf.

Girth of Instep.—Measure around the instep at right angles with the top of the foot, passing a point at the bottom of the foot midway between the end of the great toe and back of the heel.

Girth of Upper Arm.—With the arm of the subject bent hard at elbow, firmly contracting the biceps and held away from the body in a horizontal position, pass the tape around the greatest prominence. If desirable to find the girth of the upper arm when the biceps is not contracted, the arm should be held in a horizontal position and measured around the most prominent part.

Girth of Elbow.—Taken around the internal condyle of the humerus while the arm of the subject is straight, with the muscles of the forearm relaxed.

Girth of Forearm.—Taken around the largest part. The fist should be firmly clinched and the palm of the hand turned upward.

Girth of Wrist.—With the hands of the subject open and the muscles of the forearm relaxed, measure between the styloid process and the hand.

Breadth of Head.—The breadth of head should be taken at the broadest part. In taking the breadth measurements, stand behind the subject.

Breadth of Neck.—Taken at the narrowest part with the head of the subject erect and the muscles of the neck relaxed.

Breadth of Shoulders.—With the subject standing in a natural position, elbows at the sides, shoulders neither dropped forward nor braced backward, measure the broadest part two inches below the acromion processes.

Breadth of Waist.—Taken at the narrowest part.

Breadth of Hips.—Measure the widest part over the trochanters, while the subject stands with feet together, the weight resting equally on both legs.

Breadth of Nipples.—Taken from centre to centre with the chest in a natural position.

Depth of Chest.—Taken after a natural inspiration. Place one foot of the calipers on the sternum midway between the nipples, and the other foot on the spine at such a point that the line of measurement is at right angles with the axis of the spinal column. When it is desirable to ascertain the extent of the antero-posterior movement of the chest, measurements may be taken from the same points after the fullest inspiration and after the fullest expiration.

Depth of Abdomen.—Place one foot of the calipers immediately above the navel, the other on the spine at such a point that the line of measurement is at right angles to the axis of the spinal column.

Length of Shoulder to Elbow.—With the arm of the subject bent sharply at the elbow and held at the side, measure from the top of the acromion process to the olecranon. Care should be taken that the measuring rod is parallel with the humerus and not with the external surface of the arm.

Length from Elbow to Finger Tip.—With the arm of the subject bent sharply at the elbow and the rod resting on back of arm and hand, measure from the olecranon process to the tip of the middle finger.

Length of Foot.—Take the extreme length of foot from the end of the first or second toe to the back of the heel, about one inch from the surface upon which the foot rests.

Stretch of Arms.—With the arms of subject stretched out horizontally so that both hands and shoulders are in a line, with one middle finger and the zero end of the measuring rod pressed against the wall, note the point to which the other middle finger tip reaches.

Horizontal Length.—With the heels of the subject pressed hard against a perpendicular wall, with arms at the sides and body resting naturally on a horizontal plane, measure the distance of the apex of the head from the wall.

Capacity of Lungs.—The subject after loosening the clothing about the chest and taking a full inspiration, filling the lungs to their utmost capacity, should blow slowly into the spirometer. Two or three trials may be allowed.

Expiratory Strength.—As before, the subject after loosening the clothing about the chest and filling the lungs completely, should blow with one blast into the manometer. Care should be taken that no air is allowed to escape at the sides of the mouth, and that in expelling the air all the muscles of expiration are brought into play.

Strength of Back.—The subject, standing upon the iron foot-rest, with the dynamometer so arranged that when grasping the handles with both hands his body will be inclined forward at an angle of 60°, should take a full breath and without bending the knees, give one hard lift, mostly with the back.

Strength of Legs.—The subject while standing on the foot-rest with body and head erect, and chest thrown forward, should sink down, by bending the knees, until the handle grasped rests against the thighs, then taking a full breath, he should lift hard principally with the legs, using the hands to hold the handle in place.

Strength of Chest.—The subject with his elbows extended at the sides until the forearms are on the same horizontal plane and holding the dynamometer so that the dial will face outward and the indicator point upward, should take a full breath and push vigorously against the handles, allowing the back of the instrument to press on the chest.

Strength of Upper Arms, Triceps.—The subject, while holding the position of rest upon the parallel bars, supporting his weight with arms straight, should let the body down until the chin is level with the bars, and then push it up again until the arms are fully extended. Note the number of times that he can lift himself in this manner.

Strength of Upper Arms, Biceps.—The subject should grasp a horizontal bar or pair of rings and hang with the feet clear from the floor while the arms are extended. Note the number of times that he can haul his body up until his chin touches the bar or ring.

Strength of Forearms.—The subject, while holding the dynamometer so that the dial is turned inward, should squeeze the spring as hard as possible, first with the right hand then with the left. The strength of the muscles between the shoulders may be tested with the same instrument. The subject, while holding the dynamometer on a level with the chest, should grasp it with handles and pull with both arms from the centre outward.

Total Strength.—The Total Strength is purely an arbitrary, and relative, rather than an actual test of strength as its name would indicate. And while confessedly imperfect, it seems decidedly desirable that there should be some method of comparison which does not depend entirely on lifting a dead weight against gravity, or steel springs.

The bodily weight is multiplied by the sum of the "Dip and Pull." (This is divided by ten simply to prevent too great a number of figures in the calculation.) To this is added the strength of back, the strength of legs, the average of the forearms, and the lung strength. The sum is the Total Strength.

For example, the weight of No. —— is 64.6 kilos. The Dip is 11, the pull 12=23. The Back Strength is 125, the Leg Strength 150, the Forearms 40 and the Lungs 1.4. Or, $64.6 \times 23 \div 10 + 125 + 150 + 40 + 1.4 = 464.9$.

Pilosity.—Note the amount of hair on the body and limbs, excluding the head, face and pubes.

Color of Hair.—*Light* (Very Fair, Fair, Light Brown, Brown). *Dark* (Dark Brown, Black Brown, Black). *Red* (Red Brown, Red, Golden).

Color of Eyes.—*Light* (Dark Blue, Blue, Light Blue). *Dark* (Light Brown, Brown, Dark Brown, Black). *Mixed* (Gray, Green).

With these directions fully in mind, the examiner proceeds to take the measures of the student, who is with him in the Statistics Room which is at a temperature between 60° and 70° F. and as near the middle of the day as possible. With the clerk near by who has the college folio record book before him, as well as this manual, the Examiner first records the name of the person to be examined, the age, the date, and his number as preserved in the College books. The next record is that of the *Height*. If it be perchance 1720 millimeters he turns to the third page of the table, and at the line upon the top of the page among the heavy faced type finds the number 1720. Directly over this he places a V to indicate that this is the column with which the measures are compared; and he also writes 1720 on the left blank space against height. This is the real starting point in the examination, and now the examiner may go on directly down the column if he so pleases, writing the measures against the items on the left. It is, however, generally thought best to inter-

sperse the strength tests with the girths and breadths, and not bunch them, as it may be a hard strain to some persons thus to do, and not give a fair test of the full powers. Perhaps a good way is to take the Pull Up directly after the Height, the Dip after the Wrist measure, and the strength of Legs and Back near the close of the examination. So, too, the Lung tests may be one of the last things taken, as the circulation is then well maintained at the surface of the body and the Lungs free to be inflated.

It is well, however, to use the Stethoscope when the heart is quiet, just before the Pull Up, and again immediately after the same, in order that we may learn if there be irregular action or valvular disturbance. And the condition of the Lungs is ascertained by listening to the breathing at the same time.

The Eyes and Ears may be examined whenever during the process it may be most convenient.

After the examination the Examiner can at his leisure study the case, by comparing it with the column of measures as indicated by the "V" column, as well as from any other information he may gain from questions as to heredity, accidents and sickness if he should chance to make them, and as he does in the Records of Amherst College. By this time he will have learned if there be weak organs or muscles, or non development, which he will at once be in a condition to advise about or prescribe for. And what he may choose to put in writing may be entered, with the state of Eyes, Ears, Heart, Lungs and Muscles on the first page of the Anthropometric Card. And at this point may be entered what apparatus or exercise may be used to correct deficiencies or strengthen weak parts, with special reference to the directions and suggestions about the apparatus of a well furnished gymnasium in the latter part of this manual.

If the measure of Height of the young man falls between the even tens, the column should be selected which gives the nearest unit to it; if half-way between, of course the average of the two columns will be the point of study.

When the Examination is completed the College has in its records every item which the student has in his manual, and several others which the Examiner may need to make use of in giving advice for development, imperfections, or weakness. The College record is only to be seen and consulted by the Department, though every man may see his own record at any time, but not that of his neighbor.

If it is desired to make the examination and record still more complete the following blank may be used.

History and Statistics of

Date,

Age,

Birthplace,

Nationality of
- *Father*,
- *Mother*,
- *Paternal Grandfather*,
- " *Grandmother*,
- *Maternal Grandfather*,
- " *Grandmother*,

Father died of

Mother died of

Hereditary Conditions,

Accidents,

Diseases,

Condition of Thorax,

Condition of Eyes,

Condition of Ears,

Left Handed,

THE

ANTHROPOMETRIC CARD.

OF

Mr. T. F. Ellis

18 years, — months old to-day. No.

His height is 1713 millimeters, or ..... inches.

Condition of

Eyes: Myopic. Need - 2.25 Diop.

Ears: Right slightly defective. Left good.

Heart: Sound.

Lungs: Healthy. But capacity and chest girth small.

Muscles: All under sized.

DIRECTIONS AND REMARKS.

See directions pages 27 to 33 for developing lungs & muscles and increasing bodily weight.

		1600	1610	1620	1630	1640	1650	1660	1670
Height,		1600	1610	1620	1630	1640	1650	1660	1670
Height,		*63.0*	*63.4*	*63.8*	*64.2*	*64.6*	*65.0*	*65.5*	*65.7*
Weight.		53.9 118.5	54.0 118.5	54.1 119.0	54.5 119.9	54.7 120.3	55.5 122.1	57.3 127.1	57.9 127.3
Heights.	Sternum.	1290 50.8	1300 51.2	1300 51.2	1320 52.0	1330 52.2	1340 52.8	1350 53.2	1350 53.2
	Navel.	947 37.4	958 37.8	962 37.9	966 38.0	974 38.4	979 38.5	983 38.8	986 38.9
	Pubes.	797 31.3	800 31.6	810 31.9	812 32.0	814 32.1	820 32.3	835 33.0	839 33.1
	Knee	425 16.7	430 16.9	439 17.3	442 17.4	448 17.6	448 17.6	450 17.7	454 17.8
	Sitting.	851 33.5	856 33.7	869 34.2	870 34.3	879 34.5	880 34.6	883 34.7	884 34.8
Girths.	Head.	559 22.0	561 22.1	562 22.1	562 22.1	563 22.2	563 22.2	565 22.2	565 22.2
	Neck.	335 13.2	338 13.4	340 13.4	345 13.6	345 13.6	346 13.6	347 13.7	348 13.7
	Chest Repose.	851 33.5	852 33.6	854 33.7	857 33.7	857 33.7	864 34.0	865 34.0	868 34.2
	Chest Full.	881 34.6	882 34.7	888 34.9	900 35.4	900 35.4	901 35.4	903 35.5	904 35.5
	Belly.	702 27.7	703 27.7	703 27.7	703 27.7	708 27.8	709 28.0	710 28.0	710 28.0
	Hips.	860 33.9	860 33.9	864 34.0	864 34.0	873 34.4	879 34.6	881 34.8	882 34.9
	R. Thigh.	500 19.7	501 19.7	501 19.7	501 19.7	503 19.8	504 19.8	506 19.9	509 20.0
	L. Thigh.	497 19.5	498 19.6	498 19.6	498 19.6	498 19.6	500 19.7	503 16.8	506 19.9
	R. Knee.	341 13.4	341 13.4	342 13.5	343 13.5	344 13 5	346 13.6	347 13.7	348 13.7
	L. Knee.	339 13.3	339 13,3	340 13.4	341 13.4	342 13.5	344 13.5	345 13.6	346 13.6
	R. Calf.	325 12.8	326 12.8	333 13.1	335 13.2	336 13.2	337 13.1	340 13.4	342 13.5
	L. Calf.	323 12.7	324 12.7	333 13.0	333 13.1	334 13.1	335 13.2	338 13.3	340 13.4
	R. Instep.	231 9.1	231 9.1	232 9.1	233 9.2	234 9.2	236 9.3	236 9.3	237 9.3
	L. Instep.	229 9.0	229 9.0	230 9.0	231 9.1	232 9.1	233 9.2	233 9.2	235 9.2
	U.R.Arm contracted.	275 10.8	277 10.9	280 11.0	280 11.0	282 11.1	283 11.1	285 11.2	285 11.2
	U.R.Arm.	248 9.8	248 9.8	248 9.8	252 9.9	253 10.0	254 10.0	254 10.0	254 10.0
	U.L.Arm.	244 9.6	244 9.6	244 9 6	248 9.8	249 9.8	250 9.8	250 9.8	250 9.8
	R. Elbow.	241 9.5	241 9.5	242 9.5	242 9.5	242 9.5	242 9.5	245 9.6	245 9.6
	L. Elbow.	237 9.3	237 9.3	238 9.4	238 9.4	238 9.4	238 9.4	241 9.5	241 9.5

		1600	1610	1620	1630	1640	1650	1660	1670
Height,		*63.0*	*63.4*	*63.8*	*64.2*	*64.6*	*65.0*	*65.4*	*65.7*
GIRTHS.	R.Forearm.	253 10.0	253 10.0	253 10.0	254 10.0	254 10.0	255 10.0	256 1.01	257 1 01
	L.Forearm.	248 9.8	248 9.8	248 9.8	249 9.8	249 9.8	250 9 8	251 9.9	252 9.9
	R. Wrist.	161 6.3	161 6.3	162 6.4	162 6.4	162 6.4	162 6.4	162 6 4	163 6.4
	L. Wrist.	159 6.2	159 6.2	160 6.3	160 6.3	160 6.3	160 6.3	160 6.3	161 6.3
BREADTHS.	Head.	151 5.9	151 5.9	151 5.9	152 6.0	152 6.0	152 6.0	153 6.0	153 6.0
	Neck.	104 4.1	104 4.1	106 4.1	106 4.1	106 4.1	107 4.2	107 4.2	107 4.2
	Shoulders.	413 16.2	416 16.3	418 16.4	419 16.5	423 16.6	424 16.6	429 16 9	431 16.9
	Nipples.	191 7.5	192 7.6	192 7.6	193 7.6	193 7.6	194 7.6	195 7.7	196 7.7
	Waist.	245 9.6	245 9.6	245 9.6	245 9.6	247 9.7	248 9.8	248 9.8	250 9.8
	Hips.	313 12.3	313 12.3	315 12.4	316 12.4	316 12.4	316 12.4	316 12.4	318 12.5
DEPTHS	Chest.	000 0.00	000 0.00	000 0.00	000 0.00	000 0.00	000 0.00	000 0.00	000 0.00
	Abdomen.	000 0.00	000 0.00	000 0.00	000 0.00	000 0.00	000 0.00	000 0.00	000 0.00
LENGTHS.	Shoulder, Elbow, R.	349 13.7	351 13.8	353 13.9	354 13 9	357 14.0	358 14.1	361 14.2	362 14.2
	Shoulder, Elbow, L.	346 13.6	349 13 7	350 13.8	351 13.8	354 13.9	355 14.0	356 14.0	359 14.1
	R. Elbow Tip.	430 16.9	434 17.1	436 17.2	438 17.2	442 17.2	443 17.4	445 17.5	445 17.5
	L. Elbow Tip.	429 16.9	433 17.1	435 17.1	437 17.2	441 17.4	442 17.4	444 17.5	444 17.5
	R. Foot.	242 9.5	244 9.6	244 9.6	244 9.6	247 9.7	249 9.8	252 9.9	252 9.9
	L. Foot.	241 9.5	243 9.6	243 9·6	243 9.6	246 9.7	248 9.8	251 9.9	251 9.9
	Stretch of Arms.	1660 65.4	1690 66.5	1690 66.5	1690 66.5	1700 66.9	1700 66.9	1700 66 9	1720 67.7
	Horizontal Length.	1610 63.4	1620 63.8	1640 64.6	1650 65.0	1650 65.0	1660 65.4	1680 66.1	1680 66.1
STRENGTHS.	Lungs.	1.3 2.9	1.3 2.9	1.3 3.1	1.2 2.6	1.2 2.6	1.3 2.9	1.2 2.6	1.2 2.6
	Back.	126 278	126 278	126 278	126 278	126 278	127 280	128 282	129 284
	Dip.	8.0	7.3	8.8	8.1	7.4	5.8	7.3	7.0
	Pull.	10.0	10.8	10.6	11.9	10.5	9.2	10.8	10.4
	Legs.	130 287	143 315	147 324	148 326	149 328	150 331	151 333	154 339
	R.Forearm.	34 75	34 75	34 75	36 79	36 79	37 82	37 82	37 82
	L.Forearm.	31 68	31 68	31 68	33 73	33 73	34 75	34 75	34 75
	Total.	428	430	447	459	430	424	423	460
Capacity of Lungs.		3.16 193	3.21 196	3.25 198	3.27 199	3.33 203	3.44 210	3.50 214	3.52 215
Pilosity.		2.2	2.4	2.4	2.5	2.4	2.4	2.3	2.2

Height,		1680	1690	1700	1710	1720	1730	1740	1750	
Height,		*66.1*	*66.5*	*66.9*	*67.3*	*67.7*	*68.1*	*68.5*	*68.9*	1713
Weight.		60.1 132.0	60.2 132.4	61.3 134.8	61.3 134 8	61.7 135 7	62.1 136.6	62.5 137.5	63.9 140.5	535
HEIGHTS.	Sternum.	1360 53.5	1400 55.1	1400 55.1	1400 55.1	1410 55.5	1410 55.5	1420 55.9	1430 56.3	144
	Navel.	991 39.0	1020 40.2	1020 40.2	1020 40.2	1020 40.2	1040 40.9	1050 41.3	1050 41.3	1038
	Pubes.	853 33 6	862 34.0	863 34.0	863 34.0	867 34.1	870 34.3	874 34.4	880 34.6	857
	Knee.	460 18.1	473 18.6	474 18.7	474 18.7	478 18.8	484 19.0	486 19.1	486 19.1	480
	Sitting.	891 35.0	905 35.6	908 35.7	908 35.7	910 35.8	918 36.1	918 36.1	918 36.1	888
GIRTHS.	Head.	565 22.2	566 22.3	571 22.4	571 22.4	572 22.5	572 22.5	572 22.5	572 22.5	572
	Neck.	348 13.7	350 13.8	350 13.8	352 13.9	353 13.9	354 13.9	354 13.9	355 14.0	331
	Chest Repose.	872 34.3	872 34.3	876 34.5	880 34 6	887 34.8	887 34.8	889 35.0	889 35.0	816
	Chest Full.	905 35.6	909 35.8	913 35.9	916 36.1	926 36.5	930 36.6	931 36.6	931 36.6	842
	Belly.	714 28.1	722 28.4	722 28.4	723 28.4	723 28.4	726 28.5	729 28.7	731 28.7	663
	Hips.	882 34.7	884 34.8	886 34.8	886 34.8	888 34.9	895 35.2	896 35.3	908 35.7	843
	R. Thigh.	517 20.3	517 20.3	518 20.4	519 20.4	520 20.5	521 20.5	522 20.5	522 20.5	461
	L. Thigh.	514 20.2	514 20.2	515 20.3	516 20.3	517 20.3	518 20.4	519 20.4	519 20.4	451
	R. Knee.	351 13.8	352 13.9	354 13.9	355 14.0	357 14.0	360 14.2	361 14.2	364 14.3	332
	L. Knee.	349 13.7	350 13.8	352 13.9	354 13.8	355 14.0	358 14.1	359 14.1	361 14.2	335
	R. Calf.	345 13.6	345 13.6	346 13 6	347 13.7	347 13.7	351 13.8	351 13.8	351 13.8	330
	L. Calf.	343 13.5	343 13.5	344 13.5	345 13.6	345 13.6	349 13.7	349 13.7	349 13.7	325
	R. Instep.	237 9.3	237 9.3	237 9.3	239 9.4	241 9.5	242 9.5	244 9.6	244 9.6	238
	L. Instep.	235 9.2	235 9.2	235 9.2	237 9.3	239 9.4	240 9 4	241 9.5	241 9.5	230
	U.R.Arm Contracted.	287 11.3	287 11 3	290 11.4	292 11.5	293 11.5	295 11.6	296 11.6	296 11.6	242
	U.R.Arm.	254 10.0	257 10.1	257 10.1	257 10.1	260 10.2	260 10.2	261 10.3	261 10.3	220
	U.L.Arm.	250 9.8	253 10.0	253 10.0	253 10.0	258 10.1	258 10.1	257 10.1	257 10.1	218
	R. Elbow.	247 9.7	249 9.8	249 9.8	249 9.8	252 9.9	252 9.9	254 10.0	254 10.0	231
	L. Elbow.	243 9.6	245 9.6	245 9.6	245 9.6	248 9.8	248 9.8	250 9.8	250 9.8	230
	R.Forearm.	258 10.1	261 10.3	261 10.3	262 10.3	263 10.3	263 10.3	263 10.3	263 10.3	241
	L.Forearm.	254 10.0	256 10.1	256 10.1	257 10.1	258 10.1	258 10.1	258 10.1	258 10.1	230
	R. Wrist.	163 6.4	164 6.4	166 6.5	166 6.5	166 6.5	167 6.6	167 6.6	167 6.6	163
	L. Wrist.	161 6.3	162 6.4	164 6.4	164 6.4	164 6.4	165 6.5	165 6.5	165 6.5	153

		1680	1690	1700	1710	1720	1730	1740	1750	
Height,		66.1	66.5	66.9	67.3	67.7	68.1	68.5	68.9	
BREADTHS.	Head.	153 6.0	153 6.0	153 6.0	153 6.0	153 6.0	153 6.0	154 6.1	154 6.1	156
	Neck.	108 4.2	108 4.2	108 4.2	108 4.2	108 4.2	109 4.3	109 4.3	109 4.3	104
	Shoulder.	431 16.9	431 16.9	431 16.9	431 16.9	432 17.0	432 17.0	432 17.0	433 17.0	416
	Nipples.	196 7.7	196 7.7	196 7.7	196 7.7	197 7.7	198 7.8	198 7.8	199 7.9	183
	Waist.	252 9.9	252 9.9	253 10.0	253 10.0	254 10.0	254 10.0	254 10.0	254 10.0	239
	Hips.	320 12.6	324 12.7	330 13.0	332 13.1	332 13.1	332 13.1	335 13.2	335 13.2	307
	Shoulder Elbow, R.	366 14.4	366 14.4	367 14.4	368 14.5	369 14.5	369 14.5	371 14.6	376 14.8	369
	Shoulder Elbow, L.	363 14.3	363 14.3	364 14.3	365 14.4	366 14.4	366 14.4	369 14.5	373 14.7	369
	R. Elbow Tip.	446 17.6	450 17.7	455 17.9	457 18.0	460 18.1	465 18.3	468 18.4	468 18.4	455
	L. Elbow Tip.	445 17.5	449 17.7	454 17.9	456 17.9	459 18.1	464 18.3	467 18.4	467 18.4	457
DEPTHS	Chest.	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	
	Abdomen.	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 0.00	000 00.0	
LENGTHS.	R. Foot.	252 9.9	253 10.0	256 10.1	259 10.2	260 10.2	264 10.4	264 10.4	265 10.4	257
	L. Foot.	251 9.9	252 9.9	255 10.0	258 10.1	259 10.2	263 10.3	263 10.3	264 10.4	257
	Stretch of Arms.	1730 68.1	1740 68.5	1770 69.7	1770 69.7	1780 70.1	1810 71.3	1810 71 3	1810 71.3	1763
	Horizontal Length.	1690 66.5	1700 66.9	1750 67.7	1760 69.3	1760 69.3	1770 69.7	1770 69 7	1770 69.7	1733
STRENGTHS.	Lungs.	1.2 2.6	1.1 2.4	1.3 2.9	1.1 2.4	1.1 2.4	1.3 2.9	1.2 2.6	1.2 2.6	1.3
	Back.	130 287	135 298	136 300	137 301	138 304	140 309	140 309	140 309	115
	Dip.	8	7	6	6	7	8	6	6	2
	Pull.	10	9	9	10	9	10	9	9	6
	Legs.	159 350	160 353	163 359	164 361	164 361	164 361	165 364	167 368	133
	R. Forearm.	39 86	39 86	40 88	40 88	40 88	40 88	41 90	41 90	90
	L. Forearm.	36 79	36 79	37 82	37 82	37 82	37 82	38 84	38 84	92
	Total.	464	436	441	470	482	458	449	476	318
Capacity of Lungs.		3.54 216	3.60 220	3.63 221	3.66 223	3.78 231	3.90 238	3.91 239	3.94 240	310
Pilosity.		2.3	2.4	2.2	2.4	2.7	2.5	2.3	2.8	2.5

		1760	1770	1780	1790	1800	1810	1820	1830
Height,		*69.3*	*69.7*	*70.1*	*70.5*	*70.9*	*71.3*	*71.7*	*72.0*
Weight.		65.1 143.5	67.8 149.5	67.8 149.5	68.0 149.9	68.2 150.3	68.2 15.03	68.3 150.3	68.3 150.6
Heights.	Sternum.	1440 56.7	1450 57.1	1450 57.1	1460 57.5	1470 57.9	1480 58.3	1480 58.3	1500 59.3
	Navel.	1060 41.7	1060 41 7	1070 42.1	1080 42 5	1090 42.9	1090 42.9	1090 42 9	1107 44.1
	Pubes.	886 34.9	895 35.2	896 35.2	899 35.4	907 35.7	918 36.1	919 36.2	921 36.3
	Knee.	489 19.3	494 19.6	499 19.7	500 19.7	504 19.9	517 20.3	519 20.4	525 20.7
	Sitting.	924 36.4	925 36.4	925 36.4	933 36.7	934 36.7	937 36.8	939 37.0	939 37.0
Girths.	Head.	573 22.5	574 22.6	575 22.6	576 22.7	582 22.9	582 22.9	583 23 0	583 23.0
	Neck.	355 14.0	355 14.0	356 14.0	356 14.0	356 14.0	356 14.0	356 14 0	356 14.0
	Chest Repose.	890 35.0	890 35 0	891 35.1	893 35.2	894 35.2	898 35.3	898 35.3	899 35.4
	Chest Full.	931 36.6	934 36.7	936 36.8	936 36.8	938 36.9	939 37.0	953 37.5	956 37.6
	Belly.	733 29.0	738 29.0	741 29.2	745 29.3	748 29.4	748 29.4	748 29.4	749 29.5
	Hips.	912 35.9	912 35.9	912 35.9	916 36.1	921 36.2	921 36.2	922 36.3	923 36.3
	R. Thigh.	522 20.5	523 20.6	523 20.6	523 20.6	524 20.6	524 20.6	526 20.7	529 20.8
	L. Thigh.	519 20.4	519 20.4	519 20.4	519 20.4	522 20.5	522 20.5	523 20.6	527 20.7
	R. Knee.	365 14.4	366 14.4	366 14.4	367 14.4	369 14.5	369 14.5	369 14.5	369 14.5
	L. Knee.	363 14.3	364 14.3	364 14.3	365 14.4	367 14.4	367 14.4	367 14.4	367 14.4
	R. Calf.	353 13.9	353 13.9	353 13.9	354 13.9	354 13.9	356 14.0	356 14.0	356 14.0
	L. Calf.	351 13.8	351 13.8	351 13.8	352 13.9	352 13.9	354 13.9	354 13.9	354 13.9
	R. Instep.	245 9.6	245 9.6	246 9.7	247 9.7	247 9.7	247 9.7	247 9.7	247 9.7
	L. Instep.	243 9.6	243 9.6	244 9.6	245 9.6	245 9.6	245 9.6	245 9.6	245 9.6
	U.R.Arm Contracted.	296 11.6	296 11.6	297 11.7	300 11.8	300 11.8	300 11.8	300 11.8	300 11.8
	U.R.Arm	260 10.2	260 10.2	261 10.3	261 10.3	261 10.3	262 10.3	262 10.3	264 10.4
	U.L.Arm.	258 10.1	258 10.1	259 10.2	259 10.2	259 10.2	260 10.2	260 10.2	262 10.3
	R. Elbow.	254 10.0	255 10.0	255 10.0	256 10.1	256 10.1	256 10.1	256 10,1	257 10.1
	L. Elbow.	250 9.8	251 9.9	251 9.9	252 9.9	252 9.9	252 9.9	252 9.9	253 10.0
	R.Forearm.	264 10.4	265 10.4	266 10.5	267 10.5	268 10.5	268 10.5	269 10.6	269 10.6
	L.Forearm.	259 10.2	261 10.3	261 10.3	262 10.3	263 10.3	263 10.3	264 10.4	264 10.4
	R. Wrist.	168 6.6	168 6.6	168 6.6	169 6.6	170 6.7	171 6.7	171 6.7	172 6.8
	L. Wrist.	166 6.5	166 6.5	166 6.5	167 6.6	168 6.6	169 6.6	169 6.6	170 6.7

		1760	1770	1780	1790	1800	1810	1820	1830
Height,									
Height,		*69.3*	*69.7*	*70.1*	*70.5*	*70.9*	*71.3*	*71.7*	*72.0*
BREADTHS.	Head.	154 6.1	154 6.1	154 6.1	155 6.1	155 6.2	156 6 2	156 6.2	156 6.2
	Neck.	109 4.3	109 4.3	109 4.3	109 4.3	109 4.3	109 4.3	109 4.3	109 4.3
	Shoulder.	438 17.2	438 17.2	438 17.2	438 17.2	439 17.3	439 17.3	440 17.3	445 17.5
	Nipples.	199 7.9	200 7.9	200 7.9	201 7.9	201 7.9	205 8.1	206 8.1	206 8.1
	Waist.	254 10.0	256 10.1	256 10.1	256 10.1	256 10.1	260 10.2	263 10.3	263 10.3
	Hips.	335 13.2	335 13.2	336 13.2	337 13.3	340 13.4	341 13.4	341 13.4	341 13.4
	R.Shoulder Elbow, R.	381 15.0	382 15.0	384 15.1	395 15.5	396 15.6	396 15.6	397 15.6	398 15.7
	Shoulder Elbow, L.	379 14.9	379 14.9	381 15.0	392 15.4	393 15.5	393 15.5	394 15.5	395 15.5
	R. Elbow Tip.	468 18.4	470 18.5	475 18.7	480 18.9	484 19.0	485 19.1	486 19.1	488 19.2
	L. Elbow Tip.	467 18.4	469 18.5	474 18.7	479 18.9	483 19.0	484 19.0	485 19.1	487 19.2
DEPTHS	Chest.	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0
	Abdomen.	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0	000 00.0
LENGTHS.	R. Foot.	265 10.4	266 10.5	267 10.5	270 10.6	273 10.7	274 10.8	274 10.8	276 10.9
	L. Foot.	264 10.4	265 10.4	266 10.5	269 10.6	272 10.7	273 10.7	273 10.7	275 10.8
	Stretch of Arms	1810 71.3	1810 71 3	1820 71.7	1850 72.8	1870 73.6	1880 74.0	1890 74.4	1890 74.4
	Horizontal Length	1770 69.7	1780 70.1	1780 70.1	1790 70.5	1790 70.5	1790 70.5	1820 71.7	1840 72.4
STRENGTHS.	Lungs.	1.2 2.6	1.3 2.9	1.2 2.6	1.2 2.6	1.2 2.4	1.2 2.6	1.2 2.4	1.2 2.6
	Back.	141 311	141 311	141 311	142 313	145 320	147 324	147 324	148 326
	Dip.	6	6	6	6	5	4	6	6
	Pull.	8	9	9	8	8	8	8	9
	Legs.	168 370	168 370	169 372	171 377	172 379	173 381	174 384	174 384
	R.Forearm.	41 90	41 90	41 90	42 92	43 95	43 95	43 95	44 97
	L.Forearm.	38 84	38 84	39 86	40 88	40 88	40 88	40 88	41 90
	Total.	469	450	499	456	456	485	467	485
Capacity of Lungs.		4.02 245	4.03 246	4.05 247	4.18 255	4.42 270	4.43 270	4.43 270	4.48 273
Pilosity.		2.6	2.5	2.2	2.3	2.2	2.4	2.6	2.5

ANTHROPOMETRIC APPARATUS.

The ESSENTIAL APPARATUS for securing these statistics, and their approximate cost are:

Fairbanks's scales, Metric and English, with measure for heights,	$16.00
Separate Measure for heights,	8.00
Calipers for depths,	5.50
" " widths,	3.00
Back, Chest and Leg Dynamometer,	50.00
Grip Dynamometer,	10.00
Lung Dynamometer (manometer),	15.00
Spirometer, Hutchinson's,	10.00
Tape,	0.50
ALSO	
A Record book or Cards,	$8.00
A Stethoscope,	4.50
Set of colored worsteds,	1.25
Cards for Eye Tests,	0.50
Two Pairs of Spectacles,	2.00
Tuning Fork,	0.50

The SCALES may be procured at any of the agencies of A. & T. Fairbanks, St. Johnsbury, Vt. The graduated wooden MEASURES can be obtained of Tiemann & Co., New Chambers St., New York, or of Watts Bros., 178 Washington St., Boston; and the DYNAMOMETERS also of the same parties or of Thomas A. Upham, 17 Harvard Place, Boston. TAPES can be procured of George M. Eddy, 351 Classon Ave., Brooklyn, N. Y. Thomas Groom & Co., State St., Boston, can furnish RECORD BOOKS or Dr. G. W. Seaver of Yale University. N. D. Whitney, 129 Tremont St., Boston, can furnish COLORED WORSTEDS, and the CARDS FOR EYE TESTS are to be obtained of E. B. Meyrowitz, 104 East 23d St., New York. Also most of this apparatus can be procured of the Narragansett Machine Company, Providence, Rhode Island.

Dr. D. A. Sargent of Harvard College, and Dr. Luther Gulick of the Training School of the Y. M. C. Association at Springfield have each published a pamphlet giving by illustrations essentially the same methods as described in this manual.

DIRECTIONS FOR TESTING THE CONDITION OF THE EYES, EARS, LUNGS, AND HEART.

PREPARED BY DR. H. H. SEELYE.

Procure of any optician two pairs of spectacles, one with convex glasses, No.+.75 Dioptric (equal to No.+.48 in the old or English system), and the other with concave glasses, No.—.75 Dioptric. Also obtain a copy of Monoyer's test letters (a card of Dr. Dennett's modification of Monoyer's test type may be procured of E. B. Meyrowitz, optician, 104 East 23rd St., New York City), to be hung up at 5 meters distance, and a copy of Green's astigmatic lines, in the form of a clock face, to be hung up at the same distance.

Test: Seat the subject at a distance of five meters from the test cards, which should be hung in a good light. Examine each eye separately, keeping the other covered by a card or small book held in front of, but not touching it. Never press the fingers against the closed lid.

There are ten lines of letters on the test card, numbered from .1, .2, .3, etc., up to ten 10ths or 1. If now the subject can read the top line, the smallest letters on the card, with the right eye (R. E.) alone, his vision (V.) is recorded as ten 10ths or 1. (V. R. E.=1.) If he sees nothing clearly above the fifth line from the bottom, but can read that correctly, then V. R. E.=.5. If he cannot read any of the lines, then V. R. E.=0, (*i. e.* less than one-10th). Whatever the vision without glasses may prove to be, *always next* put on the *convex* spectacles and again cover the other eye. If now he can still with the right eye see as well or better than with no glasses at all, and can read the same line as before, he is Hypermetropic (H.) in that eye. For example, if without glasses it was found that V. R. E. =.5, and now after adding the convex glass his V. is improved to .8, the record would be V. R. E.=.5,+H.=.8. But if the vision is neither improved or made worse by the convex glass, the record will be thus: V. R. E.=.5,+H.=.5. If the convex glass can be used at all without decreasing the vision, no further testing with this card is needed: the subject is hypermetropic in that eye.

If it is found that the vision of the right eye equals 1. without glasses, and the addition of the convex glasses blurs the letters, the eye is Emmetropic, that is, the vision is normal (V.R.E.=1.)

If, however, the vision without glasses is less than 1., for instance only .3, and the convex glasses make even that line more indistinct, then put on the *concave* glasses. If now the vision is improved so that a higher line can be read, for instance the eighth from the bottom, the eye is Myopic, or "near sighted," and the record will be V. R. E.=.3,+My.=.8. Or again, if the vision without glasses in the left eye is found to be .7 and then with the concave glasses the top line can be read, the record will stand thus: V. R. E.=.7,+My. =1. After testing each eye separately, place the record of one above the other, for example thus:

{ V. R. E.=1.
{ V. L. E.=.6,+My.=.9.

This completes the testing for simple hypermetropia, myopia and emmetropia.

After testing the eyes as above, if the vision has not yet been made perfect in either, leave on the proper correcting glass, the convex if there is hypermetropia, or the concave if there is myopia, or use no glass if there is neither; then direct the subject's attention with that eye alone, the other being covered, to the card of radiating black lines. If he sees one or more of the lines running in any direction clearer or blacker than those at right angles to them, he is shown to be astigmatic. Either the perpendicular or the horizontal lines usually appear the blackest to the astigmatic person. If the previous record was V.R.E.=.7 and this defect is found, then it will be V.R.E.=.7,+As. Or, if before it read: V.L.E.=.3,+My.=.6, and astigmatism is found, it will read, V.L.E.=.3,+My.=.6,+As. Astigmatism may exist either alone or in combination with My. or H. If alone we might have a record thus: V.R.E.=.6,+As. ;V.L.E. =.4,+As., or if with hypermetropia thus: V.R.E.=.7,+H.=.7,+ As. ;V.L.E.=.6 ;+H.=.8,+As.

To recapitulate, in brief; if it is found that V.R.E.=1, then the R.E. is either Emmetropic or Hypermetropic. If emmetropic, the convex glass will markedly impair the vision: if hypermetropic it will not. If the V.R.E.=.9 or less, then the R.E. is either hypermetropic, myopic, astigmatic or amblyopic.

1st. If it is H. the convex glass will not greatly impair the vision.

2nd. If it is My. the concave glass will improve V.

3rd. If it is As. one of the radiating lines is blackest.

4th. If neither of these defects exists and the V. is less than .7 then Amblyopia or partial blindness may be recorded. It may read thus: V.L.E.=.6,+Am.

Caution.—Always try the *convex* glass. *Never* try the *concave* unless the convex glass blurs the vision.

In the following cases the subject should be recommended to consult an oculist concerning the advisability of wearing glasses: If the vision without any glasses is less than .4 in either or both eyes; if he complains of weak, watery or painful eyes, especially in reading, and any degree of hypermetropia or astigmatism is found to exist. These tests determine the nature but not the degree of any defect in vision, in subjects under fifty years of age.

Directions for Testing the Color Sense.

A reliable set of test worsteds of different colors may be procured of N. D. Whitney, 129 Tremont St., Boston. Among these will be found three large test skeins colored light green, purple (pink or rose), and bright red. To make the examination, spread all the worsteds out on a white cloth placed upon a table. First lay the *green* test skein a little to one side of the others, and then tell the subject to throw out of the pile and lay along side of the test skein all the lighter and darker shades of that color, or all the skeins containing a shade of that color in any degree. Avoid naming the color "green" to him. If he throws out only shades of green or light blue his color sense is normal (C.S.N.) and the test is completed. But if in addition he throws out light grays, or any other shade of gray, or light yellows, salmons, or pinks, he is color-blind. If he handles or fumbles over those shades a good deal and hesitates, as if in doubt about them, but yet does not throw them out, he probably has "feeble color sense" (C.S.F.). The examiner in these cases must use his judgment in making a certain amount of allowance for the stupidity of some persons in understanding what is wanted, especially in the young and uneducated.

If the subject is found to be color-blind, next lay down the purple or rose-colored test-skein, in place of the green, in order to determine the nature of the defect. Now tell him to throw out all the different shades of that color. If he only throws out pinks and light reds and shades approaching these he is only partly color-blind. (P.C.B.) But if he throws out decidedly bluish purples, blues, violets, greens, or grays, he is completely color blind.

No further testing is needed, but as a matter of curiosity and to prove the result, the red test skein may next be tried in the same way. If he matches with it browns or greens and grays he is completely color-blind.

The following classes may be recorded:—Color sense normal=C.S.N.; Color sense feeble=C.S.F.; Partial color-blindness=P.C.B.; Complete color-blindness=C.C.B.

Color-blind individuals should be warned against engaging in any occupation where this defect would prove dangerous or inconvenient.

Directions for Testing the Condition of the Ears.

As tests use a Politzer's Acoumeter or an ordinary watch, a tuning fork and the voice. Having previously learned by a few experiments what is the furthest distance at which the acoumeter or watch tick can be heard by normal ears, make that number of inches the denominator of a fraction, and the hearing distance of each person examined thereafter the numerator. Having found the normal hearing distance (=H.D.) to be, for the watch, for instance, about sixty inches, and that of the subject now examined to be, say forty inches, his record for the right ear would then be: H.D.R.E.=$\frac{40}{60}$. If it had been $\frac{60}{60}$ or 1, the ear would be normal. $\frac{80}{60}$ would show an abnormally acute sense of hearing. If the watch could only be heard while in *contact* with the ear, it would be recorded: H.D.R.E.=$\frac{C}{60}$. If not heard at all, then H.D.R.E.=$\frac{0}{60}$ or 0. Next test the left ear in the same way.

For the tuning fork test Dr. Clarence J. Blake's pattern is preferred as the standard, though any fork will do. As with the watch test the number of seconds any given fork can be heard to vibrate by the average normal ear must first be determined by each investigator. This number of seconds should be made the denominator of a fraction, the numerator of which will be the number of seconds the note is heard by the individual under examination. The fork is to be set in vibration by pressing the prongs together at the tips with the fingers and suddenly releasing them. Now place the vibrating prongs near the orifice of each ear, alternating constantly from one to the other till it ceases to be heard in either. This gives the numerator of the fraction for each ear. Thus if 40 seconds is the time it ought to be heard in a normal ear, and it is in the case under investigation heard 28 seconds in the right ear and 50 in the left the result might be recorded: T.F.R.E.=$\frac{28}{40}$, T.F.L.E.=$\frac{50}{40}$, meaning the right ear is deaf and the left abnormally acute. T.F.=$\frac{40}{40}$ or 1, would mean the hearing is normal.

Suppose we have found by the watch or fork test that H.D.R.E.=$\frac{40}{60}$, H.D.L.E.=1, this implies some deafness in the right ear, and

again the tuning fork will now help us to decide whether the cause lies in some defect of the auditory nerve or internal ear, or in the external or middle ear or Eustachian tube. Set the fork vibrating and then place the end of the handle against or between the subject's front teeth. If both ears are normal he will probably seem to hear the ringing of the fork equally well in both ears. But if there is a defect in one ear he will either seem to hear it louder or more feebly in the affected ear. If, as in the case we are examining, the fork is heard best in the right, i.e. the deaf ear, this tells us that the deafness is due to some defect in the more external parts of the organ, and it can probably be corrected by appropriate treatment. But if it is best heard in the left, i. e. the good ear, it goes to prove that the defect in the other ear is more deeply seated and probably cannot be greatly benefited by treatment. This effect of the tuning fork is contrary to what would ordinarily be expected, and it is often a matter of surprise to a deaf person to find that he hears with his teeth apparently better on the deaf side. We may now add to our record in this case: T.F. best R.E. If it had been heard equally well in both ears we would record: T.F.=N. (or normal).

For the voice test the examiner stands behind the subject at a definite distance to be determined by experiment with normal ears, and he then pronounces, in a tone of voice which he knows ought to be readily heard, some such series of words as house, man, pen, land, log, fan, round, dog, now, fog, pan, ship, chip, brass, floor, lock, sun, etc., and the subject repeats each one as he hears it. If he makes mistakes his "word hearing" is defective and is to be recorded thus: W.H.=D. or if normal it would read W.H.=N. It will often be found that voice sounds will be easily heard by a person found to be deaf by the watch or fork tests. Where the defect in hearing is at all marked a specialist in ear diseases should be consulted.*

To Examine the Lungs and Heart.

Procure a Camman's Binaural Stethoscope. Before the subject tries any of the strength tests, let him be seated, and while the breathing and circulation are easy apply the stethoscope to various parts of the chest. The faint respiratory murmur heard everywhere will soon become familiar, and any unusual sounds should be noted as abnormalities. These may be crackling, bubbling or whistling

*For some valuable suggestions as to the hearing tests we are much indebted to Dr. D. A. Sargent of Harvard University and Dr. Clarence G. Blake of Boston.

sounds of varying intensity. Or the respiratory murmur may be abnormally loud or entirely absent. Note whether these sounds change or disappear with deep breathing after violent exercise.

Next listen to the heart sounds. Place the stethoscope over the apex of the heart, one inch below and to the right or inner side of the left nipple. Both sounds should be heard most distinctly here. Then place the instrument two inches above this spot and listen. Then place it two inches below the centre of the top of the sternum, or breast bone, and listen in this vicinity. Any abnormal heart sounds are apt to be heard most distinctly at one of these points. In organic heart disease rough grazing or blowing sounds are heard with one or both of the normal heart sounds. Take no notice of an arterial murmur heard loudest under the outer half of each collar bone, which often closely resembles an abnormal heart murmur, especially after violent exercise.

If all the heart sounds are natural, then let the subject take the arm tests of pulling up or dipping, and immediately after let him be seated again, and then listen to see if the heart and lung sounds are still natural, though intensified by the exertion just made. Also note any irregularity in the rhythm of the heart sounds or any intermission in the beat or great increase of rapidity. There may be such, as functional disturbances, without any organic disease. When the breathing and heart sounds seem abnormal advise consulting a physician.

PRACTICAL DIRECTIONS FOR USING THE DEVELOPING APPARATUS IN PRATT GYMNASIUM, AMHERST COLLEGE.

BY DR. H. H. SEELYE.

GENERAL DIRECTIONS.

Ten or twenty minutes exercise daily is sufficient for any special development that may be desired. The best time is either before or after the regular class exercise.

Perform each exercise *slowly*, and only so long as to induce a slight feeling of fatigue in the part it is desired to develop. Just before closing the exercise may be performed rapidly.

Every new exercise should be indulged in very moderately at first, the amount and severity being increased a little every day or two. Use only light weights in the boxes at first, and gradually add to them afterwards. Each day employ in succession all the different means for developing a given part, when a little tired of one machine or exercise going to another and then to a third and so on, and later returning to those used at first.

See that the left side of the body gets as much or a little more exercise than the right, so as to avoid an unequal development.

That a given set of muscles are being most exercised may be known by the fatigue and pain felt in that part after prolonged exertion. A slight amount of aching is all that is desired.

A brief sponge or shower bath after exercising followed by a dry rub is healthy and invigorating.

Don't get discouraged or negligent, because you don't see speedy results. Pluck, time and perseverence will accomplish a great deal.

In the following directions the capital letters in parenthesis correspond to the same letters painted in red on each piece of apparatus referred to.

TO ENLARGE AND STRENGTHEN THE NECK.

Turn the head from side to side, rotating it as rapidly and and as far as possible. Stop when a little tired.

Use "Neck Machine" (*C*) 1st. Light weight at beginning. Face machine, stand erect, head strap at back of head. Draw the head slowly back as far as possible. Hold it there for a few seconds. Bow head forward and repeat as above, holding head back a little longer each time. Then repeat the exercise rapidly and continue till slightly tired. Increase the weight every few days.

2nd. Back to machine, stand erect, headstrap around forehead. Bow the head till chin touches chest, stooping a little forward at the same time. Retain a few seconds and repeat slowly and rapidly, as in 1st exercise.

3rd. Left side to machine, head band around right side of head. Bow the head over towards right shoulder. Retain, and repeat slowly and rapidly, as in last exercise.

4th. Right side to machine, reverse exercise 3rd.

TO CORRECT A TENDENCY TO PROJECT THE NECK FORWARD.

Repeat exercise No. 1 more frequently and longer than the others. With head strap at back of head, walk backward as far as possible with body erect. Repeat. In ordinary walking step slowly, body erect, elbows, shoulders and neck held stifly back, with chin retracted and eyes directed forwards and downwards about 30 feet in front.

TO REMEDY ROUND OR STOOPING SHOULDERS.

In walking step slowly, holding the elbows, shoulders and head back, and the chin down and retracted. Avoid leaning over the table in studying and writing.

Use 1st. "The Chest Weights" *(K)*. Face machine, brace first with one foot and then the other, arms extended forwards from the shoulders. Pull one arm outwards and backwards as far as possible, elbows stiff. Hold thus for a few seconds. Repeat slowly till weary. Same exercise with each arm singly, alternating. Increase the weights every few days.

2nd. Chest Expander (*E*). Face machine standing a little back from it. Grasp handles above the head. Fill the lungs. Pull arms downwards, outwards, and backwards as far as possible. Hold a few moments. Empty the lungs. Repeat slowly till slightly weary.

3rd. "Floor Pulleys" (*O*). Face machine standing quite far back. Very light weights at first. Pull arms upwards and backwards as far as possible, elbows stiff. Hold a few moments and repeat slowly till weary.

For heavier exercise use the Travelling Rings and Swinging Rings.

TO INCREASE THE SIZE OF THE CHEST AND THE CAPACITY OF THE LUNGS.

Practice daily holding the breath as long as possible, with the lungs full, chest thrown outwards, and shoulders backwards. Try five or six times at one sitting, increasing the period from thirty seconds at first to two minutes after a month's practice.

Practice Running each day. Begin with two or three laps and run slowly at first, and increase the rapidity and distance daily; continuing till considerably out of breath.

Use 1st. "The Capacity Spirometer" (*Y*) daily. Try three or four times at one sitting, increasing the capacity a little every few days.

2nd. "Chest Expander" (*E*). Face machine standing a little back. Grasp handles with hands above the head. Take a deep full breath and hold it while drawing the arms down to the sides of hips with elbows bent. Now empty the lungs, and then fill them again while the arms are passing upwards to the first position. Hold the breath and return arms to side of hips as at first, but keep the elbows stiff and arms extended at each side. Empty lungs and repeat these movements very slowly till a little tired. Then repeat the same motions with arms extended out in front, lowering the hands to the front of the hips.—Next stand with back to the machine and two or three feet in front of it, keeping one foot in advance of the other and alternating them. Grasp handles with arms upward and backward. Pull them down to the sides of hips. Now fill the lungs, and then let the arms fly backward and upward as far as possible. Holding the breath, bend forwards and again pull the arms downwards and forwards to the sides and a little in front of the hips. Now empty the lungs and again fill them, and then repeat the same motions slowly. Continue till slightly exhausted.

The "Chest Weights" *(K)* or any of the "Pulley Weights" may be used on the same general principles.

3rd. "Quarter Circle" *(F)* or "Sliding Inclined Plane" *(H)*. Keep the chest full of air and thrown outwards while lying on the back and pulling the bar downward to the hips. Fill the lungs on the upward movement. Do the same without bending elbows. Repeat slowly till a little tired.

4th. Use "Inclined" *(M)* and "Upright Parallels" *(U)* with lungs inflated.

TO STRENGTHEN AND ENLARGE THE ARM.

1st. For the Upper Arm.—Take any exercise which alternately flexes and extends the elbow. Pulling motions develop the "biceps" muscle on the upper and front part of the arm, and pushing develops the "triceps" on the opposite side.

For the "biceps" use the "chest weights" *(K)*, "chest expander" *(E)*, "inclined planes" *(F & H)*, and many of the "pulley weights," and especially the "rowing machine" *(R)*. For the triceps use the "dipping machine" *(T)*, and "inclined" *(M)* and "upright parallel bars" *(U)*, also boxing and the "striking bag" *(I)*.

For heavier work, practice on the horizontal bar, rings, and climbing rope and ladders for the biceps, and on the parallel bars for the triceps.

2nd. For the Forearm, Hand and Wrist.—Use any exercise requiring hard grasping or turning the hand. Tennis playing, Indian Club swinging, twirling dumb-bells, Piano playing, etc., are all good. Use the "Finger Machine" *(S)* with light weights, exercising each finger separately and then the whole hand till tired. Squeeze the "Hand Dynamometers" daily as hard as possible for five or six times. Hit the "Striking Bag" *(I)* with clinched fist. Wind up the weight on the "Wrestling Machine" *(X)* by a hand and wrist motion only.

TO DEVELOP AND STRENGTHEN THE ABDOMINAL MUSCLES AND WAIST.

Any exercise which bends the body forward or twists it to either side. Mowing with a scythe, balancing on a tight rope, rowing, wrestling, boxing, bowling, and swinging Indian clubs are all good. Lie on the back and with knees stiff raise the feet up as high as possible. Repeat.

"Inclined Abdominal Machine" *(A)*. At first make inclination considerable and later lower it gradually till it reaches the horizontal. Lie on back, and repeatedly bring the body to the sitting posture, keeping feet under the support. Next lie down and grasp the bar above the head, pull it down as far as possible, and when it is in front of the hips come to the sitting posture. Repeat.

Again lying down, raise the body to the sitting posture while holding the bar at arm's length above the head. Repeat. Gradually increase the weight.

"Floor Abdominal Machine" *(Ab)*, to be used in the same way as above.

"Upright Parallel Bars" *(U)*. Face the strap on either side, grasp the high pulley handle above the head, and pull it down while bowing the body forward over the strap. Repeat.

"Wall Abdominal and Stool" (*Aa*) Sit on stool placed two or three feet from the bar on the wall. Place toes under the bar. Bend body slowly backwards to the horizontal position and then recover. Repeat slow and fast.

"Horizontal Bar." Circle it, hang with legs bent L shape.

"High Pulleys" *(P)* and "Chest Weights" *(K)*. Face machines and with both hands pull ropes downward. Side to machine, with one hand pull ropes across abdomen or behind back. Wrestling Machine *(X)*, Peristaltic Machine (*G*), Sitting Abdominal Machine *(W)*.

TO STRENGTHEN A WEAK BACK.

Use 1st "Floor Pulley Weights" (*O*). Face machine standing a little back. Draw the handles from the floor to the sides of the chest straightening the body at the same time. Repeat. Then after straightening the body continue the pulling with the hands till they are carried above and behind the head as far as possible, with the body bending backward. Hold there for a few seconds, then repeat slowly till tired. Gradually increase the weights.

"Lifting Machine" (*L*), or lift weights from the floor without bending the knees. Increase slowly.

"Rowing Machine" (*R*). Pull with back more than with arms or legs.

"Upright Parallel Bars" *(U)*. Back to the strap, face to high pulley, feet under the floor brace. Grasp the handle of high pulley

with both hands, and pull it downwards and backwards till it stops behind the head, and at the same time bend the body back as far as possible over the strap. Repeat slowly till tired.

The "Chest Weights" *(K)* may be used quite similarly.

TO ENLARGE AND STRENGTHEN THE THIGHS.

Practice fast walking and running, throwing the heels high up behind; also skating, kicking, horse-back riding, and lifting weights from the floor with the knees bent. Stoop down with knees bent and then rise to the erect posture, and repeat till tired. Stoop down resting on one knee bent and holding the other leg out straight in front, and again coming to standing position.

Use 1st. "Peristaltic Machine" (*G*) slowly.

2nd. "Rowing Machine" (*R*), push and pull with the feet chiefly.

3rd. "Inclined Leg Machine" (*B*). Lie on back, feet against lower brace, legs flexed, grasp side handles, push the sliding platform up by straightening the legs. Repeat. Then use the upper brace for the feet in same way till tired.

"Floor Pulley Weights" (*O*). Face machine, put one heel in handle. Draw the foot and handle backward and forward. Repeat till tired. Toe in handle, side to machine draw foot across other leg. Back to machine, draw foot forward and upward. Light weights.

TO ENLARGE AND STRENGTHEN THE CALVES, LEGS AND ANKLES.

Practice walking so as to bring pressure against the soles and toes, especially up-hill walking. Run on the toes, not touching the heels. Hop on one foot and then on the other till tired. Jumping and dancing are good. Stand erect on the floor and raise the body on the toes fifty to five hundred times; increase the number daily.

Use "Bicycle Machine" (*Q*), pressing the treads with the toes only.

"Inclined Leg Machine" (*B*), push with the toes instead of the flat foot.

"Foot Machine and Stool" *(N)*. Adjust the ball, putting it low at first. Sit on stool, place feet in the straps and work them as on the pedals of a sewing machine. Continue till tired, and a little longer each day.

TO INCREASE THE BODILY WEIGHT.

Exercise all the muscles moderately for a short time daily. Do not become greatly fatigued. Take a short spray bath, with moderately cool water, two or three times a week. Avoid excessive mental exercise, study or worry. Do things quietly and moderately and not with a rush. Lie down and rest, or sleep for half an hour after dinner and supper if possible. Do not study soon after eating. Practice deep breathing and holding the breath, to exercise the diaphragm and stomach.

Retire early at night and sleep as long as possible. If sleepless from brain work, eat a few graham crackers before retiring, to draw the excess of blood from the brain to the stomach. Then bathe the head and back of neck with cold water, and if necessary the feet also and rub them briskly till red and dry. Rise on the toes fifty to one hundred times.

Eat slowly and freely, thoroughly chewing the food. Choose especially the following varieties of food. If any of them causes indigestion take less of that one.

Sugars, syrups, and all sweet things. Fats, fat meats and soups. Sweet vegetables of all kinds. Corn-starch, tapioca and all puddings, cakes, candies and nuts, tea coffee, chocolate and cocoa diluted with much milk and well sweetened. Cream and new milk. Butter, eggs and condiments. All other foods may be indulged in to the extent of the inclination.

Chewing gum daily before eating and between meals increases the flow of saliva, and so aids the digestion of fat-making foods. It also indirectly stimulates the secretion of the digestive juices of the stomach.

TO REDUCE EXCESSIVE BODILY WEIGHT.

Exercise vigorously and long, while warmly dressed, so as to induce profuse and prolonged perspiration. Finish with a warm or hot bath to wash away the old secretions and to induce fresh activity of the skin. Then rub dry in a warm room. Running and fast walking while warmly clothed are beneficial. Turkish baths when possible. Avoid taking too much sleep. Keep the bowels moving freely. Take Epsom or Rochelle salts if necessary.

Restrict the diet and eat moderately.

Avoid the following: Fats, sugar and starchy foods. All sweet things, syrups, candies, raisins, sweet potatoes, tapioca, rice, beets, parsnips, olives, custards, cream, ice-cream, pure milk, cake, puddings, nuts, pork, bacon, chocolate and cocoa.

Take sparingly: Potatoes, soups without fat, tea and coffee with little or no sugar and milk, veal, lamb, ham, tongue, mackerel, herring, sardines, oysters, clams, eggs, condiments, sweet fruits, pies, butter, beans, cheese, sour milk and buttermilk.

Eat more freely: Lean beef or mutton not fried, chicken, turkey, dried beef, smoked salmon, fish in general, acid fruits such as apples, grapes, peaches, lemons, oranges, etc., lemon jelly, stale bread, toast, oatmeal, oatmeal and graham crackers, turnips, celery, lettuce, pickles, peas, cabbage, and skim milk.

ANTHROPOMETRIC RECORDS OF AMHERST COLLEGE.

	Millimetres, Kilos, and Litres.	Pounds, Inches.	Held by
	Kilos.	Pounds.	
WEIGHT,	95.1	209.6	Jacobs '91
	M. m.	Inches.	
HEIGHT,	1945	76.58	Gleason '68
" Sternum,	1610	63.38	Tower '93
" Navel,	1234	48.57	Tower '93
" Pubes,	1008	39.68	Tower '93
" Knee,	578	22.76	Ludington '91
" Sitting,	1010	40.70	Brown '92
GIRTH, Head,	630	24.80	Lewis '92
" Neck,	420	16.13	Knight '91
" Chest repose,	1095	42.21	Tourtelot '87
" Chest full,	1085	42.71	Scott, '92
" Belly,	957	37.77	Moody '92
" Hips,	1070	42.13	Harlow '87
" Thighs,	665	25.74	Jacobs '91
" Knees,	436	16.76	Jacobs '91
" Calves,	422	16.21	Jacobs '91
" Insteps,	290	11.02	Dole '89
" Upper Arms,	346	13.62	Child '84
" U.R. A. Contracted,	400	15.74	Scott '92
" Elbows,	295	11.61	Allen '91
" Forearms,	320	12.60	Tourtelot '87
" Wrists,	189	7.44	Tufts '84
BREADTH, Head,	174	6.85	Young '86
" Neck,	131	5.16	Cody '89
" Shoulders,	512	20.15	Allen '91
" Nipples,	257	10.12	Harlow '87
" Waist,	315	12.40	Jacobs '91
" Hips,	381	14.99	Jacobs '91
" ShoulderElbows,	435	17.13	Derby '89
" Elbow Tips,	538	21.18	M. E. Page '86
LENGTH, Feet,	300	11.81	Hardy '87
STRETCH OF ARMS,	2068	81.42	M. E. Page '86
HORIZONTAL LENGTH,	1995	78.54	Gregg '92
	Kilos.	Pounds.	
STRENGTH of Lungs,	4.0	8.80	Evans '94
" Back,	295	650.18	Allen '91
" Legs,	425	936.96	Gill '84
" Forearms,	74.50	163.90	Alexander '92
	No. of times		
" Chest dip,	32		Daniels '90
" Chest pull up	65		H. H. Seelye '79
	Litres.	Cub. in.	
CAPACITY OF LUNGS,	6.18	376.0	Blodgett '93
TOTAL STRENGTH,	1058		E. P. Smith '92

Anthropometric Study of the Students of Amherst College.

The upper figures represent millimeters, kilograms and liters; the lower, inches, pounds and cubic inches.

BY AGE.	WEIGHT.	HEIGHTS.						GIRTHS.																							BREADTHS.										LENGTHS.				STRENGTHS.								CAPACITY OF LUNGS.	PILOSITY.	NUMBER OF MEN MEASURED.
		Body.	Sternum.	Navel.	Pubes.	Knee.	Sitting.	Head.	Neck.	Chest Repose.	Chest Full.	Belly.	Hips.	Right Thigh.	Left Thigh.	Right Knee.	Left Knee.	Right Calf.	Left Calf.	Right Instep.	Left Instep.	Upper Right Arm Contra'td	Upper Right Arm.	Upper Left Arm.	Right Elbow.	Left Elbow.	Right Forearm.	Left Forearm.	Right Wrist.	Left Wrist.	Head.	Neck.	Shoulder.	Nipples.	Waist.	Hips.	Right Shoulder Elbow.	Left Shoulder Elbow.	Right Elbow Tip.	Left Elbow Tip.	Right Foot.	Left Foot.	Stretch of Arms.	Horizontal Length.	Lungs.	Back.	Dip.	Pull.	Legs.	Right Forearm.	Left Forearm.	Total.			
1. TABLE OF THE AVERAGE STUDENT.																																																							
	61.2	1725	1410	1030	860	476	903	572	349	880	927	724	893	517	512	361	359	359	349	245	242	295	257	253	251	247	267	261	166	165	155	108	430	198	250	323	373	371	461	459	260	259	1780	1732	1.50	137	6	9	166	41	38		3.77		7988
	134.9	67.9	55.5	40.5	33.9	18.7	35.5	22.5	13.7	34.6	36.5	28.5	35.1	20.3	20.2	14.2	14.1	14.1	13.7	9.6	9.5	11.6	10.1	10.0	9.8	9.7	10.5	10.3	6.5	6.5	6.1	4.2	16.9	7.8	9.8	12.7	14.7	14.6	18.1	18.1	10.2	10.2	70.1	68.2	3.3	302			365	90	84		230		
2. TABLE OF THE STUDENT 21 YEARS OLD.																																																							
	63.1	1726	1407	1025	864	477	903	572	356	692	933	725	898	521	519	359	368	350	348	244	243	301	264	259	253	249	266	259	166	165	155	109	431	200	256	327	374	374	462	459	261	260	1794	1738	1.40	146	7	10	172	41	39		4.23		326
	138.8	67.9	56.3	40.4	34.0	18.7	35.5	22.5	14.0	35.1	36.7	28.5	35.3	20.5	20.4	14.1	14.1	13.8	13.7	9.6	9.6	11.8	10.3	10.2	10.0	9.8	10.5	10.2	6.5	6.5	6.1	4.3	16.9	7.9	10.1	12.9	14.7	14.7	18.1	18.1	10.3	10.2	70.6	68.4	3.1	322			378	90	86		258		
3. TABLE OF THE STUDENT OF MEAN PROPORTIONS.																																																							
	64.0	1720	1410	1023	860	480	910	570	350	880	925	720	890	515	510	360	360	359	350	240	240	295	260	250	250	250	260	260	165	165	154	110	430	200	250	320	370	370	460	460	260	260	1770	1730	1.20	150	4	10	175	40	37		3.90		2086
	141.1	67.7	55.5	40.3	33.9	18.9	35.8	22.4	13.8	34.6	36.4	28.3	35.0	20.3	20.1	14.2	14.2	14.1	13.8	9.4	9.4	11.6	10.2	9.8	9.8	9.8	10.6	10.2	6.5	6.5	6.1	4.3	16.9	7.9	9.8	12.6	14.6	14.6	18.1	18.1	10.2	10.2	69.7	68.1	2.6	331			386	88	82		238		
4. TABLE OF 50 PER CENT. MEASUREMENTS.																																																							
	61.6	1724	1410	1029	864	476	905	569	351	885	925	730	893	514	510	359	359	347	345	242	241	295	259	252	250	247	262	256	165	163	153	108	433	196	253	325	373	371	461	459	260	260	1789	1739	1.40	139	6	9	169	39	37	453	3.89		2230
	135.8	67.8	55.5	40.5	34.0	18.7	35.6	22.4	13.8	34.8	36.4	28.7	35.1	20.2	20.1	14.2	14.2	13.7	13.6	9.5	9.5	11.6	10.2	9.9	9.8	9.7	10.3	10.1	6.5	6.4	6.0	4.2	17.0	7.7	10.0	12.8	14.7	14.6	18.1	18.1	10.2	10.2	70.4	68.4	3.1	306			373	86	82		237		
5. TABLE OF AGES.																																																							
16 ye'rs	58.87	1716	1415	1038	866	480	888	562	344	858	897	705	854	502	498	357	358	342	339	242	241	279	250	240	245	240	253	249	166	164	154	106	418	188	246	320	374	370	466	462	263	263	1781	1733	1.31	130	4	8	151	35	34	411	3.91	2.17	40
	129.4	67.4	55.7	40.9	34.1	18.9	35.0	22.1	13.5	33.8	35.3	27.7	33.6	19.8	19.6	14.0	14.1	13.5	13.3	9.5	9.5	11.0	9.8	9.4	9.6	9.4	10.0	9.8	6.5	6.4	6.1	4.2	16.4	7.4	9.7	12.6	14.7	14.6	18.3	18.2	10.3	10.3	70.1	68.2	2.9	286			333	77	75		239		
17 "	59.22	1725	1411	1036	869	477	900	563	344	857	686	715	881	504	504	358	359	339	338	246	242	282	250	242	245	242	255	247	165	163	153	107	426	190	247	322	370	369	459	458	261	261	1780	1738	1.37	124	4	8	150	37	34	388	4.01	2.29	90
	130.2	67.9	55.5	40.7	34.2	18.8	35.4	22.1	13.5	33.7	34.9	28.1	34.7	19.8	19.8	14.1	14.1	13.3	13.3	9.7	9.5	11.1	9.8	9.5	9.6	9.5	10.0	9.7	6.5	6.4	6.0	4.2	16.8	7.5	9.7	12.7	14.6	14.5	18.1	18.0	10.3	10.3	70.1	68.4	3.0	273			331	82	75		245		
18 "	61.00	1733	1419	1040	871	481	905	565	348	867	917	725	888	512	505	359	360	344	342	244	244	290	255	248	248	244	260	252	166	164	154	108	429	192	252	323	375	373	464	464	2.61	261	1791	1747	1.42	135	5	9	158	46	36	420	4.11	2.32	220
	134.2	68.2	55.9	40.9	34.3	18.9	35.6	22.2	13.7	34.1	36.1	28.5	34.9	20.2	19.9	14.1	14.2	13.5	13.5	9.6	9.6	11.4	10.0	9.8	9.8	9.6	10.2	9.9	6.5	6.4	6.1	4.2	16.9	7.6	9.9	12.7	14.8	14.7	18.3	18.3	10.3	10.3	70.5	68.8	3.1	298			346	101	79		251		
19 "	61.59	1733	1413	1030	867	478	903	567	354	862	926	730	898	514	510	359	360	347	345	246	244	296	258	252	246	246	261	254	166	164	154	109	433	195	252	326	374	373	461	459	260	259	1787	1741	1.43	142	6	10	167	41	37	448	4.11	2.36	270
	135.4	68.2	55.6	40.5	34.1	18.8	35.5	22.3	13.9	34.7	36.5	28.7	35.3	20.2	20.1	14.1	14.2	13.7	13.6	9.7	9.6	11.6	10.1	9.9	9.7	9.5	10.3	10.0	6.5	6.4	6.1	4.3	17.0	7.7	9.9	12.8	14.7	14.7	18.1	18.1	10.2	10.2	70.4	68.5	3.1	312			368	90	82		251		
20 "	63.00	1731	1419	1037	869	480	907	566	356	889	929	735	899	515	514	360	360	340	348	246	245	300	262	256	252	247	263	257	166	165	154	109	437	197	253	327	374	373	463	462	262	262	1787	1746	1.57	145	7	10	173	42	38	471	4.23	2.41	270
	138.6	68.1	55.9	40.8	34.2	18.9	35.7	22.3	14 0	34.9	36.6	28.9	35.4	20.3	20.2	14.2	14.2	13.7	13.7	9.7	9.6	11.8	10.3	10.1	9.9	9.7	10.3	10.1	6.5	6.5	6.1	4.3	17.2	7.7	10.0	12.9	14.7	14 7	18.2	18.2	10.3	10.3	70.4	66.7	3.5	319			380	92	84		258		
21 "	63.97	1731	1412	1030	866	479	908	572	359	901	941	748	905	524	524	362	362	353	351	247	246	305	266	259	255	251	266	260	166	165	154	110	442	201	258	328	374	373	464	461	261	260	1792	1756	159	152	8	11	179	44	40	497	4.27	2.48	220
	140.6	68.1	55.6	40.5	34.1	18.9	35.7	22.5	14.1	35.4	37.0	29.4	35.6	20.5	20.6	14.2	14.2	13.9	13.8	9.7	9.7	12.0	10.5	10.2	10.0	9.9	10.5	10.2	6.5	6.5	6.1	4.3	17.4	7.9	10.1	12.9	14.7	14.7	18.3	18.1	10.3	10.2	70.6	69.1	3.5	335			395	97	88		260		
22 "	64.15	1732	1413	1031	861	477	909	569	361	909	949	755	908	525	521	363	363	354	353	249	247	308	262	256	256	252	268	261	167	165	155	110	443	203	260	336	373	373	461	461	262	262	1763	1746	1.66	153	8	11	175	44	40	503	4.35	2.47	150
	141.3	68.2	55.6	40.6	33.9	18.8	35.8	22.4	14.1	35.8	37.4	29.7	35.7	20.7	20.5	14.3	14.3	13.9	13.9	9.8	9.7	12.1	10.3	10.1	10.1	9.9	10.5	10.3	6.6	6.5	6.1	4.3	17.4	8.0	10.2	13.2	14.	14.7	18.1	18.1	10.3	10.3	70.6	68.7	3.6	337			386	97	89		265		
23 "	63.02	1731	1417	1033	862	479	908	567	358	899	944	749	901	526	521	358	363	356	347	247	246	300	262	258	253	249	264	257	166	165	154	110	439	200	258	329	375	374	466	464	261	260	1788	1743	1.58	152	8	10	175	45	38	477	4.31	2.54	70
	138.6	68.1	55.8	40.7	33.9	18.9	35 7	22.3	14.1	35.4	37.1	29.5	35.5	20.7	20.5	14.1	14.3	14.0	13.7	9.7	9.7	11.8	10.3	10.1	10.0	9.8	10.4	10.1	6.5	6.5	6.1	4.3	17.3	7.9	10.1	12.9	14.8	14.7	18.3	18.3	10.3	10.2	70.4	68.6	3.5	335			386	99	84		263		
24 "	65.47	1732	1417	1041	869	482	908	573	363	915	959	766	915	526	522	364	366	356	355	251	249	310	270	258	258	253	269	262	167	167	155	111	446	206	264	333	379	378	467	465	263	262	1791	1752	161	150	7	10	177	44	40	486	4.38	2.88	60
	143.9	66.2	55.8	41.0	34.2	19.0	35.7	22.6	14.3	36.0	37.8	30.2	36.0	20.7	20.5	14.3	14.4	14.0	14.0	9.9	9.8	12.2	10.6	10.1	10.1	10.0	10.6	10.3	6.6	6.6	6.1	4.4	17.6	8.1	10.4	13.1	14.9	14.9	18.4	18.3	10.3	10.3	70.5	69.0	3.5	331			390	97	88		267		
25 "	65.08	1733	1414	1041	867	471	913	571	367	917	957	770	915	527	524	358	362	355	352	253	250	311	270	265	257	254	268	262	168	166	155	111	445	208	266	333	371	371	460	461	261	261	1781	1735	1.46	143	7	10	175	44	40	467	4.38	2.70	20
	143.1	68.2	55.7	41.0	34.1	18.5	35.9	22.5	14 4	36.1	37.7	30.3	36.0	20.7	20.6	14.1	14.2	14.0	13.9	10.0	9.8	12.2	10.6	10.4	10.1	10.0	10.5	10.3	6.6	6.6	6.1	4.4	17.5	8.2	10.5	13.1	14.6	14.6	18.1	18.1	10.3	10.3	70.1	68,3	3.2	315			366	97	88		267		
6 "	64.71	1750	1439	1041	867	487	922	570	358	894	949	749	914	519	515	369	362	351	350	249	248	305	265	259	255	252	267	260	168	167	154	111	447	205	261	335	384	382	471	470	263	262	1821	1761	1.44	150	7	9	179	43	39	489	4.45	2.64	20
	142.3	68.9	56.7	41.0	34.1	19.2	36.3	22.4	14.1	35.2	37.4	29.5	36.0	20.4	20.3	14.1	14.2	13.8	13.8	9.8	9.8	12.0	10 4	10.2	10.0	9.9	10.5	10.2	6.6	6.6	6.1	4.4	17.6	8.1	10.3	13.2	15.1	15.0	18.5	18.5	10.3	10.3	71.7	69.3	3.2	331			395	95	86		271		1430